KING SAUD UNIVERSITY
COLLEGE OF COMPUTER & INFORMATION SCIENCES
DEPT OF COMPUTER SCIENCE

CSC311 Computer Algorithms
Third Semester 1444
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Tutorial #1

1. Given the matrices A and B of sizes m x l and l x n respectively.

   a) Write the pseudocode to compute the matrix C = A x B
   b) What is the complexity of the code that you wrote?

2. Consider the following code fragment,

   x ←1
   for i ← 1 ..n step 3 do
   x ← x +2
   print x

   What value of x will be printed (express it as a function of n)

3. Consider the following code fragment,

   x ←5
   i ← 1
   While (2 i < N) do
   i ← i +2;
   x ← x +3;

   print x

   What value of x will be printed (express it as a function of N)

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4. Show that 6n + 3n log(n^5) = O(n logn). Find the appropriate values of C and n_0 .

5. Show that $2n^3 - 10n^2 + 2$ =O(n^3). Find the appropriate values of C and n_0.

6. Prove or disprove the statement, 2^{n+2} = O(n^2).

7. Prove that 3^n = O(n !). Find the appropriate values of C and n_0.

8. Compare the order of growth for 3^{2n} and 5^n.

Q1. (a)

```
for i <- 1...n
    for j <- 1...n
        C[i,j] = A[i,1] * B[1,j]
return C
```

(b)

$\sum_{i=1}^{n} 1+1 = n+1$	for $i \in 1 \ldots n$
$n(n+1)$	for $j \in 1 \ldots n$ do
n^2	$C[i,j] = A[i,1] * B[1,j]$
1	return C

$\Theta(n^2)$

2 : $X = 1 + \sum_{i=1}^{\frac{1}{3}} 2 = 1 + \left[\frac{1}{3}\right] + 2$

3 : $5 + \sum_{i=1}^{n} 2i + 3^i = 5 + n^2 + n + \frac{3}{2}(3-1)$

Q4: $6n + 15n \log n \leq$

$6n \log n + 15n \log n$

$\leq 21 n \log n$

$\uparrow$

c

$c = 21$

$n_0 = 2$ So $6n + 3n \log n$ is

$O(n \log n)$

5. $2n^3 - 10n^2 + 2 \leq 14n^3$

$C = 14 \quad n_0 = 2$

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6. (F) because $n \geq 1 \rightarrow 2^{4n^2}$ will always bigger than n^2 $\quad 2^n \cdot 2^2 \leq Cn^2$

$$\frac{2 \cdot 4}{h^2} \leq C$$

Z: $3^n \leq n! \quad n \geq n_0$

$3^n = 3 \times 3 \ldots$ (n times) $\leq n! \quad 1 \times 2 \times 3 \ldots n$

$6 n! \geq (2 \times 3) \times 1 \times 2 \times 3 \ldots n$

$3^n = 3 \times 3 \times 3$

$6 n! \geq 3^n$

$C = 6 \quad n_0 = 1$

$\therefore 3^n$ is $O(n!)$ #

$g: 3^{2n} - y^n$

$g^n \leq C * y^n \quad n \geq n_0$

$g^n \leq y * g^n$

$C = 9 \quad n_0 = 1$

3^{2n} is $O(g^n)$

$5^n \leq C\, 5^n \quad n \geq n_0$

$5^n \leq 2 * 5^n$

$C = 2 \quad n_0 = 1$

5^n is $O(5^n)$

Both has exponential order of growth